What is claimed is:

1. Piezoelectric-powered tire revolution counter, including:

a piezoelectric element mounted in a pneumatic tire in a manner to be subjected to periodic mechanical stresses as the tire rotates;

power circuitry connected to the piezoelectric element and having an output for supplying a DC voltage to power circuitry of the revolution counter; and

a revolution counting circuit connected to the piezoelectric element;

characterized in that:

the piezoelectric element is in the form of a circular unimorph.

2. Piezoelectric-powered tire revolution counter, according to claim 1, wherein:

the piezoelectric element circular unimorph comprises a piezoelectric crystal formed as a circular plate; a support element formed as a circular plate and bonded to a first side of the piezoelectric crystal; and an electrode coated on a second side of the piezoelectric crystal, characterized in that:

the support element is a brass plate which has a larger diameter than the piezoelectric crystal.

3. Piezoelectric-powered tire revolution counter, according to claim 2, characterized in that:

the piezoelectric crystal is approximately 24 mm in diameter and 0.18 mm in thickness, and is mounted concentrically to the support element which is approximately 42 mm in diameter and 0.22 mm in thickness.

4. Piezoelectric-powered tire revolution counter, according to claim 2, characterized in that:

the piezoelectric crystal is composed of lead zirconate-titanate (Pb(Zr1-xTix)O3).

5. Piezoelectric-powered tire revolution counter, according to claim 1, wherein the revolution counting circuit is characterized by:

a signal processing circuit element, having a low pass filter for attenuating high frequency signal noise in the energy pulses; a voltage limiter comprising forward and backward biased diodes for limiting voltage and current in the signal; and a Schmitt trigger receiving an output of the forward and backward biased diodes, for converting a signal with relatively irregular shape to a clean square wave for interfacing with the revolution counting circuit;

a digital logic circuit for counting;

a monostable vibrator circuit element to expand the on-time in the signal pulse; and

a microcontroller circuit element with non-volatile data storage for updating the revolution count in its non-volatile data storage, and for making the count available to an optional external reading device.

Abstract